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WATER QUALITY MEMORANDUM

Utah Coal Regulatory Program

November 30, 2010

TO: Internal File

THRU: Jim Smith, Permit Supervisor 2 Dec 2010

FROM: Steve Christensen, Environmental Scientist SCC

RE: 2010 Second Quarter Water Monitoring, Genwal Resources, Inc., Crandall Canyon Mine, Permit & Tracking #3558

Water monitoring requirements for the Crandall Canyon Mine can be found in Sections 7.31.21, *Ground Water Monitoring Plan* and 7.31.22, *Surface Water Monitoring Plan.* Additional information can be found in Tables 7-4, 7-5, 7-8, 7-9 and 7-10.

Water encountered during mining operations was pumped to the portals and discharged to Crandall Creek under UPDES Permit No. UTU0024368. Discharges to Crandall Creek were within the limitations established by the permit with rare exceptions. Prior to 2008 the only sample containing iron at greater than 1 mg/L was on July 26, 2004, when iron was 1.08 mg/L.

Following the mine collapse in August 2007, the pumps were removed from the mine and discharge ceased temporarily. From September 2007 through December 2007 water pooled within the mine, flooding the underground workings. In January 2008 the mine began discharging by gravity flow and has been discharging continuously since. The temporary seals placed in the portals following the collapse required modification for the mine water discharge. Iron concentrations in the mine water discharge occasionally exceeded 1 mg/L from January to November 2008; and have been greater than 1 mg/L continuously since December 2008. Construction of a mine water treatment system began in December 2009 and approved by the Division in January of 2010.

1. Was data submitted for all of the MRP required sites? YES ☒ NO ☐

Springs

The approved MRP requires the monitoring of 24 springs each quarter. Of these 24 springs, 9 require laboratory water quality analysis (See Table 7-4). The remaining 15 springs require quarterly monitoring of field parameters (flow, pH, specific conductance and

temperature).

Data was submitted for all of the required 24 spring monitoring sites.

Streams

The approved MRP requires the monitoring of 12 surface water/stream sites. Of these 12 surface water/stream sites, 9 require laboratory water quality analysis (See Table 7-8). The remaining 3 sites require quarterly monitoring of field parameters (flow, pH, specific conductance, temperature and dissolved oxygen).

Data was submitted for all stream monitoring sites.

Wells

The approved MRP outlines monitoring of 7 wells. According to Table 7-4, all 7 wells required quarterly laboratory water quality analysis. However, due to the mine disaster on August 6th, 2007, the active mine-workings have been sealed thus rendering the wells inaccessible.

UPDES

The UPDES Permit/MRP (UT000024368) requires monthly monitoring of 2 outfalls: 001 and 002. Outfall 001 is associated with the discharge from the primary sediment pond at the main mine facility. Outfall 002 is associated with the mine-water discharge that reports directly to Crandall Creek.

Outfall 001 did not report a discharge for this quarter. Data was submitted for Outfall 002.

Pre-Treatment Mine Water Discharge

As part of the permitting process for the mine-water treatment system (Task ID #3461, approved January 27th, 2010), the Permittee has committed to monthly sampling of the pre-treatment mine water discharge for the following parameters:

- *Iron (total, dissolved and ferrous)*
- *Manganese (total and dissolved)*
- *Aluminum (total and dissolved)*
- *Alkalinity*
- *Sulfate*

- *pH*
- *Dissolved Oxygen*

Monthly data was collected for the pre-treatment mine water discharge and submitted.

2. Were all required parameters reported for each site? YES ☒ NO ☐

Springs

All required parameters were reported for each of the spring monitoring sites.

Streams

All of the required parameters were reported for all of the stream monitoring sites.

Wells

NA- Since the mine collapse in August of 2007, the monitoring wells are inaccessible.

UPDES

Outfall 001 did not report a discharge for this quarter. Outfall 002 was sampled each month of the quarter as required by the UPDES discharge permit. All required parameters were reported for Outfall 002.

As part of the approval for the mine-water treatment system (Task ID #3461), the Permittee committed to obtain additional monthly samples for Outfall 002. The parameters include (D-Fe, FE2+, T-Mn, D-Mn, T-Al, D-Al, Alkalinity and Sulfate). Concentrations were reported for each of the additional parameters at Outfall 002.

Pre-Treatment Mine Water Discharge

As discussed above, monthly sampling of the Pre-Treatment Mine Water Discharge became a requirement with the approval of the mine-water discharge treatment system.

The required pre-treatment mine discharge parameters were reported this quarter as required.

3. Were any irregularities found in the data? YES ☒ NO ☐

Springs

SP-36 had reported an elevated Dissolved Calcium (D-Ca) values the fourth quarter of 2009. Since that time, the D-Ca values have been reported well within two standard deviations from the mean of the data set.

Streams

As the total iron (T-Fe) concentrations in the mine-water discharge began to increase, it was feared that a similar rise would be observed in stream monitoring site LOF-1 (lower Crandall Canyon flume). An upward trend of T-Fe began to surface the second quarter of 2008. The reported T-Fe concentration for the fourth quarter of 2009 was 1.479 ppm. However, the last two quarters (including this one) have produced significantly lower T-Fe concentrations as the mine-water treatment system has been successful in reducing the iron levels (0.503 ppm and 0.106 ppm for the 1st and 2nd quarter of 2010 respectively). Continued monitoring will be conducted in order to evaluate the continued effectiveness of the treatment system as well as the amount of T-Fe ultimately discharging into Crandall Creek.

Shingle Creek reported an elevated conductivity value the fourth quarter of 2009 (1,028 ppm). The site was inaccessible the 1st quarter of 2010. An elevated conductivity value was again reported this quarter (921 ppm). Continued monitoring will be conducted in order to determine if trend is emerging relative to the conductance of the drainage.

UPF-1 (Upper Flume Crandall Creek) reported elevated SO4, Total Hardness and TDS in the fourth quarter of 2009. All three parameters have been reported at markedly lower concentrations (well within two standard deviations from the mean) for the last two quarters. Continued monitoring will be conducted to evaluate potential trends.

UPDES Sites (001 and 002)

Outfall 001 reported no observable flow for the quarter.

Outfall 002 reported an average flow value of 510.7 gallons per minute (gpm) based upon three sampling events. Additionally, total iron levels (T-Fe) fell back to within compliance levels as established by the UPDES permit. T-Fe concentrations of 0.497 ppm, 0.502 ppm and 0.427 ppm were reported for April, May and June respectively. The mine-water treatment system appears to be functioning as designed in reducing the T-Fe concentrations of the mine-water discharge to less than 1.0 ppm as required by the Permittee's discharge permit. The mine-water treatment system was approved by the Division on January 27th, 2010 and its construction completed in the 1st quarter of 2010. The mine-water treatment system utilizes a Maelstrom oxidizer unit, a coagulant and flocculent injection system and settling basin.

A field inspection of the Crandall Creek drainage was performed on May 5th, 2010. The purpose of the inspection was to determine what (if anything) could be done to reduce the orange

staining of the Crandall Creek channel. Representatives from the USDA Forest Service, the Division of Water Quality as well as the Division were present. Due to the sensitivity and high value habitat of the Crandall Creek drainage, it was determined that for the time being, no action would be taken to remove the iron precipitate from the channel. It was agreed by the agency representatives that any attempt at physically removing the material could potentially cause undue damage to the channel and its substrate.

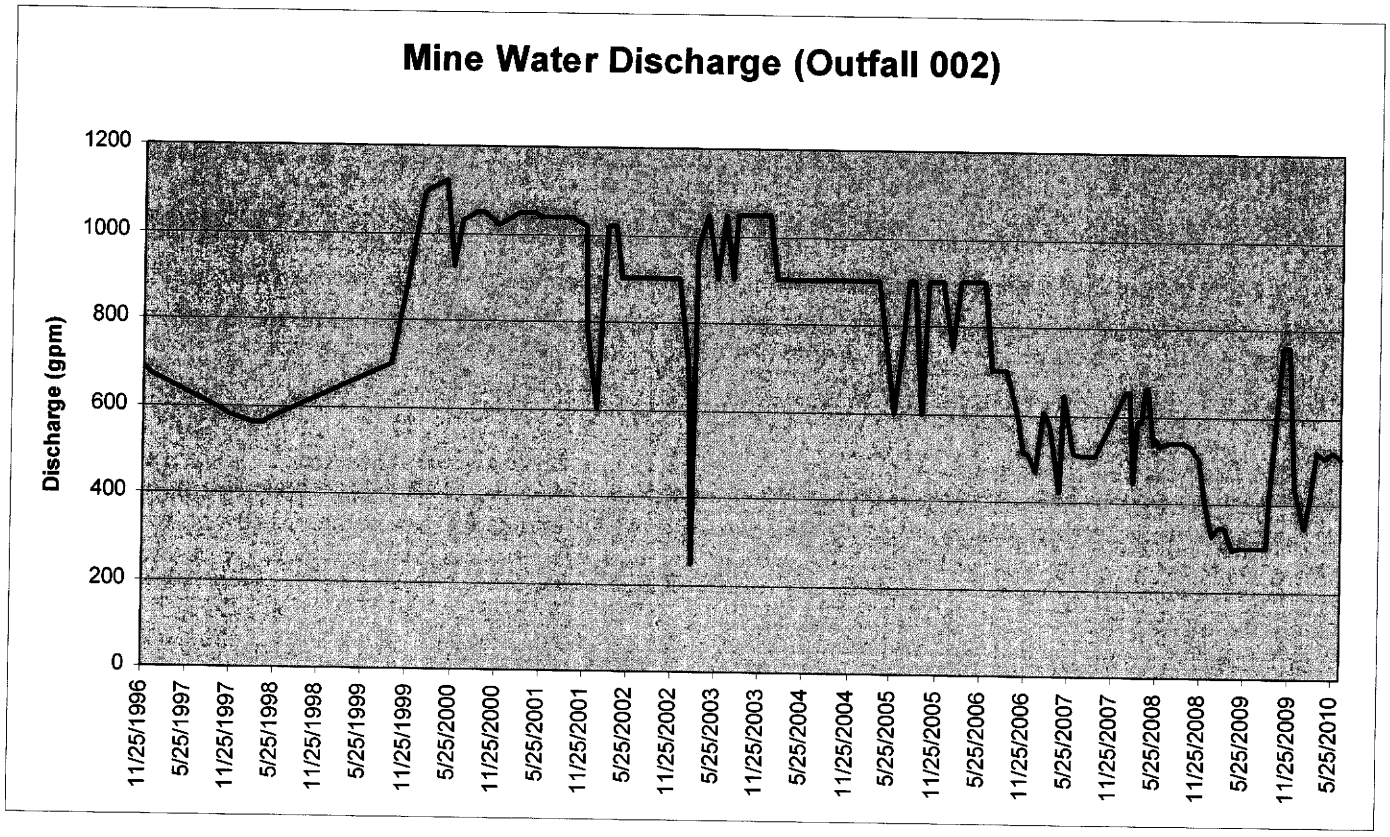
4. On what date does the MRP require a five-year re-sampling of baseline water data.

Page 7-33 of the MRP states that groundwater samples collected during the low flow period (typically the 4th quarter) every 5 years will be analyzed for baseline parameters (See Tables 7-5). The 4th quarter of 2010 will be the next sampling event where baseline data will be required.

Page 7-35 of the MRP states that surface water samples collected during the low flow period every 5 years will be analyzed for baseline parameters (See Table 7-9). The 4th quarter of 2010 will be the next sampling event where baseline data will be required.

5. Based on your review, what further actions, if any, do you recommend?

Continued data collection and monitoring of the mine-water discharge will be necessary to evaluate the effectiveness of the mine-water treatment system. Monitoring of the pre-treatment mine-water will help determine the overall chemistry of the raw mine-water and help determine if the T-Fe concentrations are showing any change in concentration.


Mine Water Discharge (Outfall 002)
Discharge (gpm)
1200
1000
800
600
400
200
0
11/25/1996
5/25/1997
11/25/1997
5/25/1998
11/25/1998
5/25/1999
11/25/1999
5/25/2000
11/25/2000
5/25/2001
11/25/2001
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11/25/2005
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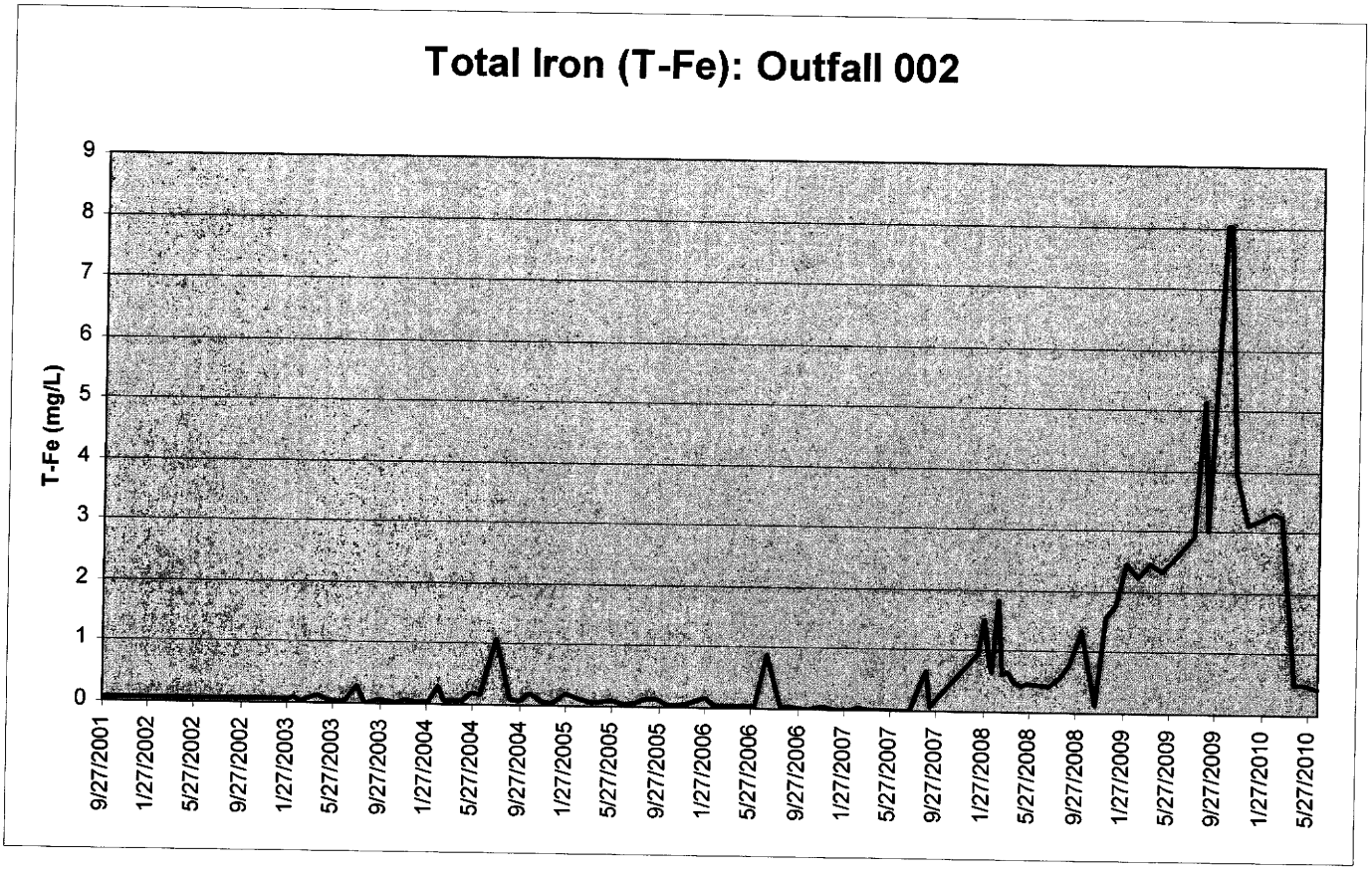
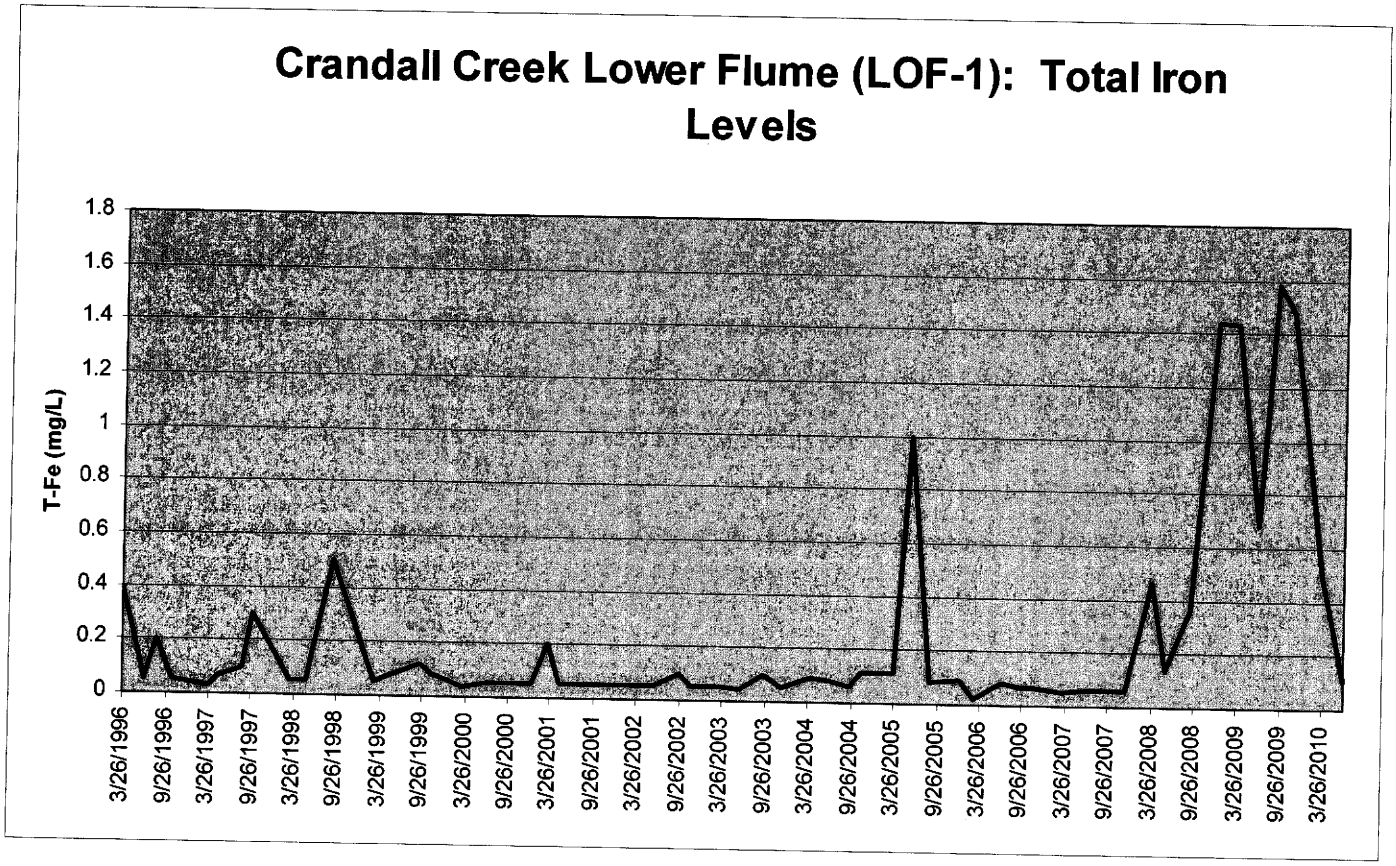
5/25/2008
11/25/2008
5/25/2009
11/25/2009
5/25/2010


Total Iron (T-Fe): Outfall 002
T-Fe (mg/L)
9
8
7
6
5
4
3
2
1
0
9/27/2001
1/27/2002
5/27/2002
9/27/2002
1/27/2003
5/27/2003
9/27/2003
1/27/2004
5/27/2004
9/27/2004
1/27/2005
5/27/2005
9/27/2005
1/27/2006
5/27/2006
9/27/2006
1/27/2007
5/27/2007
9/27/2007
1/27/2008
5/27/2008
9/27/2008
1/27/2009
5/27/2009
9/27/2009
1/27/2010
5/27/2010


Crandall Creek Lower Flume (LOF-1): Total Iron Levels
T-Fe (mg/L)
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
3/26/1996
9/26/1996
3/26/1997
9/26/1997
3/26/1998
9/26/1998
3/26/1999
9/26/1999
3/26/2000
9/26/2000
3/26/2001
9/26/2001
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3/26/2004
9/26/2004
3/26/2005
9/26/2005
3/26/2006
9/26/2006
3/26/2007
9/26/2007
3/26/2008
9/26/2008
3/26/2009
9/26/2009
3/26/2010